Numerical Simulations of the First Operational Conditions of the Negative Ion Test Facility SPIDER

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The ITER project requires additional heating provided by two injectors of neutral beams resulting from the neutralisation of accelerated negative ions. To study and optimise negative ion production, the SPIDER (Source for Production of Ions of Deuterium Extracted from an Rf plasma) test facility is under construction in Padova, with the aim of testing beam characteristics and to verify the source proper operation.

The SPIDER beam parameters are a particle energy of 100keV and a beam current of 50A; the beam source will be of the radiofrequency type; negative ions will be mostly generated on the source surfaces covered by a thin layer of evaporated caesium. SPIDER experiments will start in 2016.

The present contribution will briefly describe the specific features of the SPIDER accelerator and the expected preliminary phases of the SPIDER operations, dedicated to source and accelerator commissioning: with the goal of improving SPIDER performances, voltage holding conditioning of the accelerator, caesium conditioning of the source, beam extraction will be carried out.

The expected beam features will also be described by means of numerical simulations, considering the detailed magnetic and electrostatic configuration of the accelerator, the various operational phases, the corresponding expected source and beam parameters. These results will be most useful to prepare for the earliest experimental campaigns.